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EXAMINER	
NGUYEN, LAM S	

ART UNIT	PAPER NUMBER
2853	

DATE MAILED: 07/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/642,951	FONTAINE ET AL.	
	Examiner	Art Unit	
	LAM S. NGUYEN	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/15/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-6, 8-16, 20-21, 27, 30-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujii et al. (US 5668579).

Referring to claims 1, 13, 16, 27, 30, 33:

Suzuki et al. discloses an apparatus that is an ink jet print head (*FIG. 37*) comprising:

a plurality of droplet ejection devices (*FIG. 5: The array of ejection actuator 10 includes multiple actuators 27*), each said droplet ejection device including:

a fluid chamber (*FIG. 37, element 6*) having a volume and an ejection nozzle (*FIG. 37, element 4*),

a piezoelectric actuator (*column 1, lines 39-52*) or a diaphragm (*FIG. 37, elements 5, 21*) that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance (*FIGs. 7, 7A, element 5*) associated with the piezoelectric actuator changes in charge between an actuated condition and an unactuated condition (*FIG. 35: The displacement of diaphragm 5 in associated with the capacitance*), and

a first switch (*FIG. 7, elements 42*) that has a first input connected to

an electric source terminal (*FIG. 7: The first input is the emitter of transistor 42, that is connected to the voltage source Vcc*), a first output connected to said piezoelectric actuator (*FIG. 7: The first output is the collector of transistor 42, that is connected to the actuator 5 through resistor 43*), and a first control signal input (*FIG. 7: The first control signal input is the base of transistor 42, that is connected to the signal input 51*) to determine whether said first input is connected to or disconnected from said first output (*FIG. 7: When the input signal 51 is high/low, transistor 42 is ON/OFF to connect/disconnect the voltage source Vcc to the actuator 5*) , wherein an applied electric source distributes a constant voltage electrical signal to said first inputs of said plurality of droplet ejection devices (*FIG. 7, element Vcc)*, and

a controller (*FIG. 5, element 62*) that provides respective charge control signals to respective said first control signal inputs (*FIG. 5-6: The controller 62 provides control signals to the charge circuit 64 and the discharge circuit 65 through the timing pulse generation means 63*) to control an extent of change in charge on respective said capacitances when the respective said first switch connects said electrical signal to the respective said piezoelectric actuator (*FIGs. 7, 11: The charge signal controls the charge time period t10-t11 in which the transistor 42 connects the voltage source Vcc to the actuator 5*) and to set a constant amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective said piezoelectric actuator, wherein the disconnection maintains a constant voltage on respective said capacitances by the storing the constant amount of charge on respective said capacitances (*FIGs. 7, 11: During the "hold" period, even though transistor 42 disconnects the voltage source Vcc and the actuator 5, the charge V1 is constantly maintained. Note that since resistor 47 has a sufficient high resistance*

value, the resistor has little influence during the charge and discharge process (column 15, lines 58-67)).

wherein each of said plurality of droplet ejection devices is configured for individual control of charge accumulation (magnitude) on respective said capacitances and for individual control of the extent of change in charge on respective said capacitances (*FIG. 5-6: The charge magnitude and the charge time period of each ejection actuator 27 in the array 10 is individually driven/controlled by the charge circuit 64 of an associate driver 40*).

Referring to claims 2, 34: wherein said electrically actuated displacement device moves between a displaced position and an undisplaced position as a capacitance associated with the piezoelectric actuator changes between a charged, actuated condition and an uncharged, unactuated condition, and wherein said controller that provides respective charge control signals to respective said first control signal inputs to control the extent of charge placed on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said piezoelectric actuator (*FIG. 7: The input signal 51 is provided to turn on transistor 42, then the ON state of transistor 42 connects the voltage source to the actuator*).

Referring to claims 3, 15, 31, 35: wherein each said droplet ejection device also includes a second switch (*FIG. 7: Transistor 45*) that has a second input connected to a discharging electrical terminal (*FIG. 7: The emitter of transistor 45*), a second output connected to said piezoelectric actuator (*FIG. 7: The collector of transistor 45*), and a second control signal input (*FIG. 7: The base of transistor 45*) to determine whether said second input is connected to or disconnected from said second output, and wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of

the charge on said respective capacitances (*FIG. 6-7: The controller 62, through the timing pulse generator 63 sends the discharge signal to the input 52 of the discharge circuit 65*),

and wherein each of said plurality of droplet ejection devices is configured for individual control of the discharge of the charge on respective said capacitances (*FIG. 5-6: The discharge process of each ejection actuator 27 in the array 10 is individually driven/controlled by the discharge circuit 65 of an associate driver 40*).

Referring to claims 4-5, 6: wherein each said droplet ejection device comprises a first resistance (*FIG. 7, element 43*) between said electric source and said piezoelectric actuator and is external of an electrical path from said electrically actuated displacement device to said second switch, and wherein each said droplet ejection device comprises a second resistance (*FIG. 7, element 46*) between said discharging electrical terminal and said electrically actuated displacement device.

Referring to claim 8: wherein a plurality of resistors (*FIG. 7A: All resistors associate to transistor 108 and switch 106*), voltages (*FIG. 7A: The voltage source, ground, and the input voltage*) and switches (*FIG. 7A: Switches are element 106 and transistor 108*) are connected to each said piezoelectric actuator and controlled by said controller to change the charge on said capacitance.

Referring to claim 9: wherein said discharging electrical terminal is at ground (*FIG. 7: The emitter of transistor 45 is connected to ground*).

Referring to claims 10-12: wherein said electrical signal is a controlled or constant voltage/current signal (*column 18, lines 8-12: The power supply source is controlled to regulate the voltage of current*).

Referring to claim 14: wherein said first control signal terminates the connection of said constant voltage to said piezoelectric actuator when the charge on said piezoelectric actuator is at a predetermined value which is less than said constant voltage (*column 18, lines 20-35: The voltage charge Va is less than the voltage source Vs*).

Referring to claim 32: wherein the amount of charged on the capacitance is greater in the actuated condition than the amount of charge in the unactuated condition (*FIG. 11: The area covers by the curve V1 associates with the "charge" period is larger than that of the "discharge" period*).

Referring to claim 20: wherein said first and second control signals are controlled to connect said electrical signal to respective said piezoelectric actuators for respective predetermined times (*FIG. 11: The first and second control signals correspond the "charge" and "discharge" time period, respectively*).

Referring to claim 21: wherein respective said first control signals are controlled to connect said electrical signal to respective said piezoelectric actuators until respective said piezoelectric actuators achieve respective predetermined charge voltages (*FIG. 11: The charge voltage is predetermined by defining the width of the "charge" period*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 7, 17-19, 22-26, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (US 5668579) in view of Murakami et al. (US 4563689).

Fujii et al. discloses the claimed invention as discussed above except wherein a single resistance is used to charge and discharge a respective capacitance (**Referring to claims 17-19**). Fujii et al. is also silent wherein said first control signals are controlled to provide uniform droplet volumes or velocities from said plurality of droplet ejection devices or to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide pay scale control (**Referring to claims 17-19**), wherein said first control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device (**Referring to claims 22-23),** wherein said first control signals are controlled to inject noise into images being printed so as to break up possible print patterns and banding (**Referring to claims 24-25**), wherein said first and second control signals are controlled to vary the amplitude of charge as well as the length of time of charge on said electrically actuated displacement device for the first droplet out of a droplet ejection device so as to match subsequent droplets (**Referring to claim 26),** and wherein said controller controls said first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency (**Referring to claim 29**).

Murakami et al. discloses an ink jet printing apparatus having a driving circuit for controlling the charge/discharge on an actuator having an associated capacitance to cause the actuator to displace for ejecting ink purpose (*FIG. 7, element 7*), wherein the driving circuit includes switches, voltages, and at least one resistor that is used to charge and discharge the actuator (*FIG. 7, element 6*), and a controller for providing control signals to provide uniform or

different droplet volumes or velocities from said plurality of droplet ejection devices so as to provide pay scale control (*column 3, lines 1-7, lines 65-68: Since the ink droplet size can be freely changed, the drop volumes can be controlled to be uniform or at predetermined value*), to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device (*column 4, lines 13-17: Said preceding pulse not having enough energy for the ink to be ejected from the nozzle*), to provide inject noise into images being printed so as to break up possible print patterns and banding (*column 2, lines 37-40: The noise is the satellite droplets*), to vary the amplitude of charge as well as the length of time of charge on said electrically actuated displacement device for the first droplet out of a droplet ejection device so as to match subsequent droplets (*column 6, lines 20-25: Changing the pulse height and width of the pulse*), and to control a first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency (*column 6, lines 20-25*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the controller disclosed by Fujii et al. to be able to provide control signals that provides uniform or different droplet volumes or velocities as disclosed by Murakami et al. The motivation for doing so would have been to effect high-quality halftone-gradation recording as taught by Murakami et al. (*column 3, lines 60-63*).

3. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (US 5668579) in view of Murakami et al. (US 4563689), as applied to claims 1 and 13, and further in view of Imanaka et al. (US 6467863) and Butterfield et al. (US 6685297).

- Fujii et al., as modified, discloses the claimed invention as discussed above except

wherein said controller mounted to a monolithic body in which said fluid chambers are formed.

Imanaka et al. discloses an ink jet recording head having a controller (*FIG. 4B, element 46*) mounted on a circuit board (*FIG. 4B, element 33*) that a plurality of ink chambers are formed (*FIG. 4B, element 9 or 7a*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the circuit board of the print head disclosed by Suzuki et al. to include also the controller as disclosed by Imanaka et al. since this is a common technique well known in the art to eliminate the wire connection between the recording head and the controller in order to avoid any problem caused by the wire connection.

- In addition, Fujii et al., as modified, and Imanaka et al. do not disclose wherein the controller includes a field programmable gate array.

Butterfield et al. discloses a printing apparatus having a controller that can be a microprocessor based device programmed in a desired manner such as a field programmable gate array (*column 3, lines 6-12*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the controller disclosed by Suzuki et al. in view of Imanaka et al. to be an field programmable gate array as disclosed by Butterfield et al. The motivation for doing so would have been to be able to program the operation of the controller in a desired manner as taught by Butterfield et al. (*column 3, lines 6-12*).

Response to Arguments

Applicant's arguments filed 05/03/2006 have been fully considered but they are not persuasive.

The applicant argued that Fujii taught away from using piezoelectric devices as evidenced by the passage on column 1, lines 39-47. It is the examiner's point of view that the above passage only discusses some drawbacks in manufacturing a piezoelectric printhead, but does not indicate that the piezoelectric actuators can not be used with the driving circuit described throughout the specification of the invention. Moreover, eventhough, the applicant pointed out the differences between electrostatic actuators and piezoelectric actuators, the applicant did not provide any evidence to show why piezoelectric actuators can not be used with the described driving circuit.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LN
07/11/2006

STEPHEN MEIER
SUPERVISORY PATENT EXAMINER